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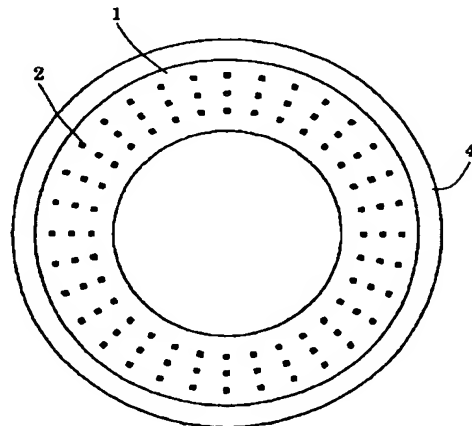
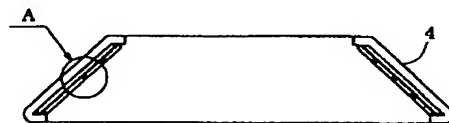
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(54) 【発明の名称】 L E D 照明装置およびその製造方法

(57) 【要約】

【課題】 照明の光学的特性のコントロールが容易で、照明部の形状に関する設計自由度の大きい、小型の L E D 照明装置。

【解決手段】 所定の立体的な形状に保持されたフレキシブルプリント回路基板 (1) と、フレキシブルプリント回路基板に所定のパターンにしたがって直接装着された多数の発光ダイオード素子 (2) とを備えている。また、フレキシブルプリント回路基板を所定の立体的な形状に保持するためのハウジング (4) と、多数の発光ダイオード素子を全体的に保護するための保護層 (3) とをさらに備えている。



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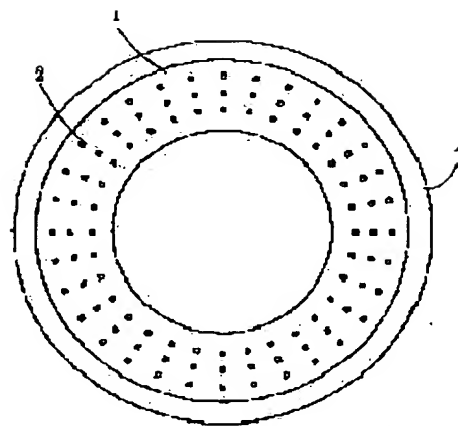
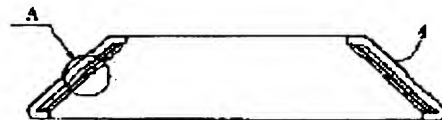
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(54) LED LIGHTING SYSTEM AND ITS MANUFACTURING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a small LED lighting system easy to control optical characteristics of illumination and having large design flexibility on a shape of an illumination part.

SOLUTION: This LED lighting system is equipped with a flexible printed circuit board 1 held in a predetermined three dimensional shape; many light emitting diodes 2 directly mounted on the flexible printed circuit board according to a prescribed pattern; a housing 4 for holding the flexible printed circuit board in the predetermined three dimensional shape; and a protecting layer 3 for totally protecting the many light emitting diodes.



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CLAIMS

[Claim(s)]

[Claim 1] The Light Emitting Diode lighting system characterized by having the flexible printed circuit substrate held at the three-dimensional predetermined configuration, and the light emitting diode element of a large number with which the aforementioned flexible printed circuit substrate was directly equipped according to the predetermined pattern.

[Claim 2] The Light Emitting Diode lighting system according to claim 1 characterized by having further housing for holding the aforementioned flexible printed circuit substrate in the aforementioned three-dimensional predetermined configuration.

[Claim 3] The Light Emitting Diode lighting system according to claim 1 or 2 characterized by having further the protective layer for on the whole protecting the light emitting diode element of aforementioned a large number.

[Claim 4] A Light Emitting Diode lighting system given in the claim 1 characterized by forming a lens, a filter, or a diffusion board for controlling an optical property including a luminous-intensity-distribution property etc. in the front face of the light emitting diode element of aforementioned a large number, or any 1 term of 3.

[Claim 5] The light emitting diode element of aforementioned a large number is a Light Emitting Diode lighting system given in the claim 1 characterized by equipping the aforementioned flexible printed circuit substrate through an electroconductive glue, or any 1 term of 4.

[Claim 6] The manufacture method of the Light Emitting Diode lighting system characterized by providing the following The wearing process which equips with many light emitting diode elements directly the flexible printed circuit substrate which has a superficial predetermined configuration according to a predetermined pattern The protective-layer formation process which forms the protective layer for on the whole protecting the light emitting diode element of a large number with which the aforementioned flexible printed circuit substrate was equipped through the aforementioned wearing process The configuration maintenance process of holding the aforementioned flexible printed circuit substrate obtained through the aforementioned protective-layer formation process in a desired three-dimensional configuration

[Claim 7] The aforementioned wearing process is the manufacture method of the Light Emitting Diode lighting system according to claim 6 characterized by including the process which equips the aforementioned flexible printed circuit substrate with the light emitting diode element of aforementioned a large number through an electroconductive glue.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the especially suitable Light Emitting Diode lighting system for the manufacturing installation of a semiconductor device etc. about a Light Emitting Diode lighting system and its manufacture method.

[0002]

[Description of the Prior Art] For example, in the lighting system used being included in the manufacturing installation of a semiconductor device etc., a limit is received in many cases about an installation space. Moreover, when performing an advanced image processing, in optical performances, such as a luminous-intensity-distribution property, high specification (spec.) is searched for in many cases.

[0003] Conventionally, as this kind of a lighting system, as shown in drawing 4 and drawing 5, array wearing of the Light Emitting Diode (light emitting diode) element 41 with many resin lenses is carried out at the glass base-material epoxy resin substrate 42 (refer to drawing 4) of non-flexibility, or the electrode holders 43 (refer to drawing 5), such as aluminum and a resin. And the substrate 42 or the electrode holder 43 is held with housing 44. Moreover, a lens, a filter, the diffusion board 45 (refer to drawing 4), etc. may be formed in the luminescence side side of many Light Emitting Diode elements 41 if needed.

[0004]

[Problem(s) to be Solved by the Invention] However, usually, the Light Emitting Diode element 41 with a resin lens by which the mould was carried out with the resin has about 5x10mm of ϕ 3x4 mm- ϕ i, and large size, and in case it miniaturizes a lighting system, it is that it is restrained. Moreover, with the Light Emitting Diode element 41 with a resin lens, since the resin lens is adjusting the angle of beam spread of light, the source of luminescence is large, control of an optical property is difficult, and it is easy to generate illuminance nonuniformity in an irradiated plane.

[0005] Moreover, in composition of equipping with the Light Emitting Diode element 41 with a resin lens, it is difficult for the glass base-material epoxy resin substrate 42 of non-flexibility to give a three-dimensional configuration to a substrate 42 after wearing of the Light Emitting Diode element 41, and the design flexibility about the configuration of the lighting section is small. Also in composition of equipping an electrode holder 43 with the Light Emitting Diode element 41 with a resin lens on the other hand, it is difficult to give a three-dimensional configuration to an electrode holder 43 after wearing of the Light Emitting Diode element 41, although flexibility is in arrangement of an electrode holder 43, and the design flexibility about the configuration of the lighting section is small.

[0006] In addition, without attaching a resin lens to a Light Emitting Diode element, each Light Emitting Diode element is protected and modularized by the resin, and the technology of equipping a non-flexibility substrate with many Light Emitting Diode modules is known. Also in this conventional technology, after equipping with many Light Emitting Diode modules, it is difficult for a non-flexibility substrate to give a three-dimensional configuration, and it is [about the configuration of the lighting section / design] small.

[0007] this invention is made in view of the above-mentioned technical problem, and it aims at offering a small Light Emitting Diode lighting system with easy control of the optical property of lighting, and the large design flexibility about the configuration of the lighting section, and its manufacture method.

[0008]

[Means for Solving the Problem] In order to solve the aforementioned technical problem, in this invention, the Light Emitting Diode lighting system characterized by having the flexible printed circuit substrate held at the three-dimensional predetermined configuration and the light emitting diode element of a large number with which the aforementioned flexible printed circuit substrate was directly equipped according to the predetermined pattern is offered.

[0009] According to the desirable mode of this invention, it has further housing for holding the aforementioned flexible printed circuit substrate in the aforementioned three-dimensional predetermined configuration. Moreover, it is desirable to have further the protective layer for on the whole protecting the light emitting diode element of aforementioned a large number. Furthermore, it is desirable that a lens, a filter, or a diffusion board for controlling an optical property including a luminous-intensity-distribution property etc. is formed in the front face of the light emitting diode element of aforementioned a large number. Moreover, as for the light emitting diode element of aforementioned a large number, it is desirable that the aforementioned flexible printed circuit substrate is equipped through an electroconductive glue.

[0010] Moreover, the wearing process which equips with many light emitting diode elements directly the flexible

printed circuit substrate which has a superficial predetermined configuration according to a predetermined pattern according to another aspect of affairs of this invention. The protective-layer formation process which forms the protective layer for on the whole protecting the light emitting diode element of a large number with which the aforementioned flexible printed circuit substrate was equipped through the aforementioned wearing process. The manufacture method of the Light Emitting Diode lighting system characterized by including the configuration maintenance process of holding the aforementioned flexible printed circuit substrate obtained through the aforementioned protective-layer formation process in a desired three-dimensional configuration is offered. In this case, as for the aforementioned wearing process, it is desirable to include the process which equips the aforementioned flexible printed circuit substrate with the light emitting diode element of aforementioned a large number through an electroconductive glue.

[0011]

[Embodiments of the Invention] In this invention, the flexible printed circuit substrate is directly equipped with many light emitting diode elements (Light Emitting Diode element) according to a predetermined pattern. Therefore, after equipping with many light emitting diode elements, it is easy for a flexible printed circuit substrate to give a desired three-dimensional configuration, and big design flexibility can be secured about the configuration of the lighting section.

[0012] Moreover, in this invention, the flexible printed circuit substrate is directly equipped with much light emitting diode element itself [small], without attaching a resin lens to a light emitting diode element. Therefore, adjustment of the interval of the small source of luminescence etc. is easy, as a result it is easy to control the optical property of lighting. As mentioned above, in this invention, a small Light Emitting Diode lighting system with easy control of the optical properties (luminous-intensity-distribution property etc.) of lighting and the large design flexibility about the configuration of the lighting section is realizable.

[0013] The operation form of this invention is explained based on an accompanying drawing. Drawing 1 is drawing showing roughly the composition of the Light Emitting Diode lighting system concerning the 1st operation form of this invention. Moreover, drawing 2 is the enlarged detail of the A section of drawing 1 . If drawing 1 and drawing 2 are referred to, the lighting system of the 1st operation form is equipped with the flexible printed circuit substrate 1. The flexible printed circuit substrate 1 is regularly equipped with many light emitting diode elements 2 directly according to the predetermined pattern.

[0014] That is, through the electroconductive glue, it fixes to the flexible printed circuit substrate 1 directly, respectively, and the terminal by which print formation was carried out, and the terminal of each light emitting diode element 2 are electrically connected to the flexible printed circuit substrate 1 for many light emitting diode elements 2, respectively. Furthermore, as shown in drawing 2 , the protective layer 3 for on the whole protecting the light emitting diode element 2 of a large number with which the flexible printed circuit substrate 1 was equipped continues all over the simultaneously of the flexible printed circuit substrate 1, for example with a suitable transparent resin, and is formed of coating.

[0015] And the flexible printed circuit substrate 1 in which was equipped with many light emitting diode elements 2, and the resin protective layer 3 was formed is held at the three-dimensional annulus ring configuration with the housing 4 which has a function as a maintenance board, and a function as a heat sink. In addition, between the flexible printed circuit substrate 1 and housing 4, the heat dissipation sheet 5 is formed if needed.

[0016] By the way, the flexible printed circuit substrate 1 has the radii configuration which has fixed width of face in the state where it developed to the plane. With the 1st operation form, the flexible printed circuit substrate 1 which has this superficial radii configuration is directly equipped with many light emitting diode elements 2 according to a predetermined pattern. And when the flexible printed circuit substrate 1 applies a suitable transparent resin almost extensively, the protective layer 3 for on the whole protecting the light emitting diode element 2 of a large number with which the flexible printed circuit substrate 1 was equipped is formed.

[0017] Subsequently, the flexible printed circuit substrate 1 in which was equipped with many light emitting diode elements 2, and the resin protective layer 3 was formed is held in a desired three-dimensional annulus ring configuration with the housing 4 which has a three-dimensional annulus ring configuration. In this way, in the state where it was held with housing 4, the flexible printed circuit substrate 1 presents the three-dimensional annulus ring configuration which cuts off the side of a cone at the flat surface of a couple parallel to the base, and is acquired. At this time, the ends of the flexible printed circuit substrate 1 which has a radii configuration in a flat-surface state fix mutually if needed.

[0018] Drawing 3 is drawing showing roughly the composition of the Light Emitting Diode lighting system concerning the 2nd operation form of this invention. The 2nd operation form has the 1st operation form and analogous composition. However, with the 1st operation form, to the flexible printed circuit substrate presenting the three-dimensional annulus ring configuration, by the 2nd operation form, the flexible printed circuit substrate 1 is presenting the three-dimensional rectangle configuration, as shown in drawing 3 .

[0019] the [as mentioned above, / above-mentioned / the 1st and] -- with 2 operation gestalten, the flexible printed circuit substrate 1 is directly equipped with many light emitting diode elements 2 according to a predetermined pattern. Therefore, after equipping with many light emitting diode elements 2, it is easy for the flexible printed circuit substrate 1 to give a desired three-dimensional configuration, and big design flexibility can be secured about the configuration of the lighting section.

[0020] the [moreover, / above-mentioned / the 1st and] -- with 2 operation forms, the flexible printed circuit substrate 1 is directly equipped with much light emitting diode element 2 small very thing, without attaching a resin

lens to a light emitting diode element. Therefore, adjustment of the interval of the small source of luminescence etc. is easy, as a result it is easy to control the optical properties (luminous-intensity-distribution property etc.) of lighting. Moreover, it is possible by forming a lens, a filter, or a diffusion board in the front face of many light emitting diode elements 2 to control an optical property (luminous-intensity-distribution property).

[0021] In addition, although each above-mentioned operation form shows the example which held the flexible printed circuit substrate in the three-dimensional annulus ring configuration or the rectangle configuration, it is possible to form the lighting section held in various configurations within the limits of this invention, without being limited to this.

[0022] By the way, with each above-mentioned operation form, the light emitting diode element 2 is the semiconductor device itself, and in case the flexible printed circuit substrate 1 is equipped with the light emitting diode element 2, soldering cannot be used. This has the thing (that is, there is no wettability well [quality of the material]) which a pewter does not ride on the light emitting diode element 2, and the too small light emitting diode element 2, and operation of soldering (for example, about 0.3mmx0.3mm) originates in an almost impossible thing. Then, with each above-mentioned operation form, as mentioned above, the flexible printed circuit substrate 1 is equipped with the light emitting diode element 2 through an electroconductive glue.

[0023] Specifically, a silver paste (silicon system) is applied to the flexible printed circuit substrate 1 punctiform [much], and many light emitting diode elements 2 are put on it. And by giving suitable heat-treatment, a silver paste melts and the light emitting diode element 2 and the flexible printed circuit substrate 1 paste up. In addition, if conditions agree without being limited to a silver paste, a copper paste metallurgy paste etc. can also be used for an electroconductive glue.

[0024] Although the process which equips the flexible printed circuit substrate 1 with many light emitting diode elements 2 can also be performed by the handicraft here, it is advantageous to use the surface mount technology in the field of a semiconductor device. In this case, the process which applies a silver paste through a dispenser is performed, the process which puts the light emitting diode element 2 which carried out adsorption maintenance through the mounter one by one is performed, the process which carries out bonding of the gold streak between a substrate and an element through a bonding machine is performed, and the process heated through a predetermined heating means at the last is performed.

[0025]

[Effect of the Invention] As explained above, in this invention, a small Light Emitting Diode lighting system with easy control of the optical property of lighting and the large design flexibility about the configuration of the lighting section is realizable. In addition, the Light Emitting Diode lighting system of this invention can be applied to the lighting the manufacturing installation of the common product containing a semiconductor device, and for test equipment, without being limited to the lighting system included in the manufacturing installation of a semiconductor device.

[Translation done.]